2023

High-energy heavy-ion physics is connected to a large variety of physics disciplines. Researches probe fundamental concepts of classical and modern thermodynamics, hydrodynamics, and quantum theory. Therefore, they have several theoretical and practical topical research directions covering a wide spectrum, such as: thermodynamics, perturbative and non-perturbative QCD, high-energy nuclear effects, hadronization, hadron phenomenology, phenomenology of compact stars, and gravity/cosmology. These studies are strongly motivated by the needs of several recent and planned large-scale facilities, such as collaborations at the LHC (CERN, Switzerland) and RHIC (BNL, USA), and future experiments at Hi-Lumi LHC or FCC (CERN), and FAIR (GSI, Germany). They have continued these theoretical investigations in the direction of high-energy physics phenomenology connected to existing and future state-of-the-art detectors. Concerning international theoretical collaborations, they have established joint work with the Goethe Institute (Germany), LBNL (USA), CCNU, MAP (China), UNAM (Mexico), and ERI (Japan). The most important published results are highlighted below.

Investigating heavy-ion collisions — High-energy heavy-ion collisions are one of the best testbeds for the non-ideal, non-equilibrium, finite systems. In this areas the machine learning-based models are quite successful, which progress we continued.

Together the Indian Institute of Technology (IIT) Indore they investigated whether a deep neural network (DNN) algorithm is able to map the momentum asymuthal anisotropy parameter (v_2 – the second Fourier component), measured in non-central heavy-ion collisions. One of the important observables for studying QGP is the transverse collective flow. Their work was focused towards designing experimental techniques to measure the flow coefficients, mainly the second order flow coefficient known as the elliptic flow (v_2). They focused on studying Monte Carlo simulations and use deep learning methods in the machine learning framework to estimate the elliptic flow in heavy-ion collisions. They used final state hadrons' kinematic information as input, which can be made available from the detectors in experiments. Several scaling properties of v_2 are also explored (Fig.1) in their works such as the centrality, energy, transverse momentum (p_T), number of constituent-quarks (NCQ) scaling through identified light-flavour particles' elliptic flow. This work showed a promising path forward, which needs to be explored further before implementing this method in the experiments [1-3].

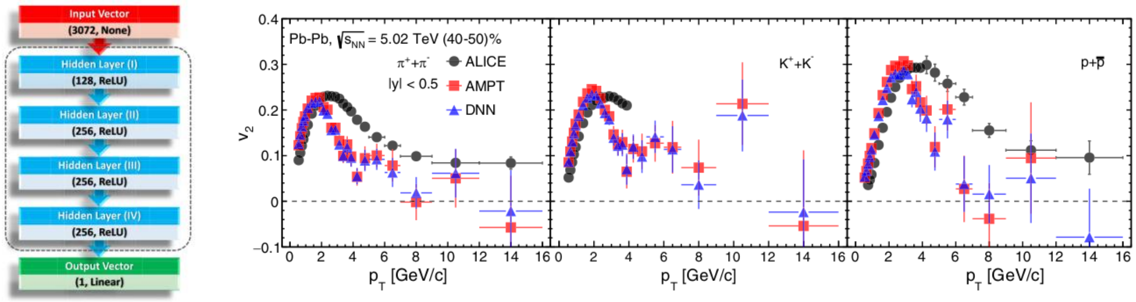


Figure 1: Reproduction of ellliptic flow parameter (v2, left) using a Deep Neural Network DNN

In collaboration with the University of Berkeley (USA) and IoPP CCNU (Wuhan, China), they further developed the HIJING++ heavy-ion Monte Carlo Generator with G. Papp (ELTE) and X.N. Wang (IoPP CCNU, LBNL). They applied the model for searching 'hedgehog-like' events in small and large systems. This is a joint project between Wigner RCP and the ICN UNAM. Moreover the machine learning-based hadronization model has been developed and tested successfully, and a similar model has been applied in accelerator physics [4, Extra2].

The effective field theory of the strong interaction — They studied the dilepton production in nuclear scattering, synthesis of new elements in nuclear processes in compact stars, emission of bremsstrahlung photons in nuclear reactions at different energies. Main focus was given on study of dilepton production. In this problem incoherent processes were investigated in production of lepton pairs in the scattering of protons off nuclei. New quantum mechanical model has been constructed which uses generalization of the nuclear model of emission of photons in the proton-nucleus reactions in region from low up to high energies with inclusion of formalism of production of lepton pairs. As a primary result, the model with the coherent matrix elements was tested for the scattering of protons on nuclei Be at energy of proton beam Ep of 2.1 GeV. The calculated cross section of production of lepton pairs is in good agreement with experimental data obtained by DLS Collaboration. Dilepton production for nuclei-targets ^{9}Be, ^{12}C, ^{16}O, ^{24}Mg, ^{44}Ca, ^{197}Au at E_p=2.1 GeV has been analyzed, and found that the coherent cross sections of dilepton production are monotonously decreased with increasing of nucleus-target mass. This new effect is explained by suppressing of production of dileptons (by nuclear matter of nucleus-target). Results confirmed the importance of incoherent processes in study of dilepton production in this reaction, which was in good agreement with experimental data from HADES collaboration [5-7].

We continued our investigation of the finite volume effects on the phase diagram of strongly interacting matter, and in particular the critical endpoint (CEP) via momentum space constraints. We found that the different constraints and boundary conditions can give substantially different results, e.g. for the trend or even the existence of the critical endpoint for small system sizes, explaining certain differences in the literature. We have also studied the size dependence of the baryon fluctuations in the vicinity of the CEP, which is one of the candidate observables to identify criticality in an experiment [8-9].

We developed a coalescence model for heavy ion collisions, which has one fitting parameter only (compared the two in other models) and still describe the existing data very well. We applied this model to hypernuclei production at CBM energies. This may allow us the learn about the strangeness interaction in nuclear matter, in neutron stars, at the same time we contribute to the CBM research program [10-12].

Multi-wavelength astronomy and investigations of extreme matter in the Universe — Investigation of cold compact stars provides the opportunity to understand cold super-dense nuclear matter. These theoretical developments are strongly connected to recent measurements of compact stars by multi-wavelength observations and gravitational waves and the future Einstein Telescope, which are supported by theoretical networking EU COST action PHAROS (CA162014) until 2022. They also contributed to the AstroNet EU roadmap, the CREDO collaboration [13] and the CREMLIN+ H2020 project.

They studied a class of compact stars, the hybrid stars, using a soft and a stiff hadronic model, a constituent quark model with three quark flavors, and applying a smooth crossover transition between the two. In a Bayesian framework, the effect of recent constraints from neutron star observations on the equation of state parameters and several neutron star observables were investigated. They showed that a pure quark core is only possible if the maximum mass of neutron stars is below ~2.35 solar masses. This results has been found, in agreement with other studies, that a peak in the speed of sound greater than 1/3 is strongly favored by astrophysical measurements [13,14].

They studied compact stars with extra spatial dimensions in the Kaluza-Klein model. Speed of sound were extracted in relation to the size of the compactified extra dimension, which were constraint by neutron star data. A study on how non-linear optics is related to curved space-time physics was published in the American Journal of Physics, where a popular-science presentation of this physics issu is presented on mirages above water bodies [16].

In another, still ongoing research, we investigated the observability of tidal interactions in eccentric binary neutron star systems. Collaborating with University of Oxford, we have found that the effect of dynamical tides might be observable through shifting the phase of the gravitational-wave signal of the binary inspiral. The preparation of a manuscript about this research is in its final stage.

They studied further the properties of Sedov-type self-similar solutions of non-relativistic self-gravitating fluids in completely spherically symmetric systems by adding with rotation. The evolution and the rotation of the Universe with dark matter has been presented in an analytical model, which might be applicable for the understanding of the Hubble puzzle [17].

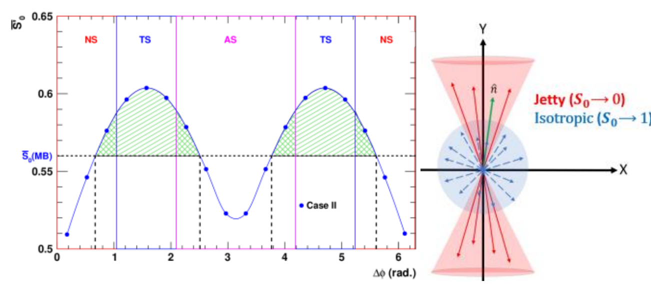
In the Einstein Telescope Collaboration the work within the Site Preparation Board were continued intensively: They also participated in the group's infrasound measurement campaign at Sos Enattos mine in Sardinia, and near Warsaw. In the joint work with ATOMKI infrasound micropohones were set and collect data at adVirgo detector. A new windshield and protection against humidity were tested at the Jánossy Underground Research Laboratory (VLAB). They also carried out test measurements, data processing and documentation writing in the second phase of the R&D project SeismoCell, using seismic and infrasound sensors [POS,VIRGO].

Rare and anomalous radionuclei decay of ^{137}Cs measurements were investigated during the year at the Jánossy Underground Research Laboratory (VLAB). To perform high-precision studies of nuclear decay anomalies they used a high-purity germanium (HPGe) detector setup. They finished the first 6-month period of measurement, which has been presented on the TAUP conference. A similar research project has been started on galactic archeology applying denoising autoencoder (DAE) neural networks in low-resolution (stellar) spectroscopy. The project is in collaboration with the Johns Hopkins University.

Applying novel thermodynamical and hydrodynamical approaches — Applying Liu method of irreversible thermodynamics and assuming one scalar internal variable the family of generalized Korteweg fluids are derived. Identifying the internal variable with the gravitational potential the model includes Newtonian gravity as a special relaxed subcase, furthermore, assuming an extra term in the specific energy a generalization of the gravitational Poisson equation can be derived, which can be considered as an alternative to MOND (Modified Newtonian Dynamics). The holographic property for perfect (non-dissipative) fluids has been proved in general. We investigated the opportunitites of mathematical solution methods for coupled heat conduction and acoustic phenomena observed in supercritical fluids. They developed a method which is free of artificial numerical errors based on the operator splitting procedure. The above-mentioned generalized Korteweg fluid model can also be analyzed with this method. This is a fundamental breakthrough, that highlights the origin of quantum mechanics in thermodynamics. The methodology is constructive and predictive, introducing a new thermodynamical quantisation procedure among others [18-19,Ván Szűcs].

They investigated novel thermodynamical models focusing on the non-Fourier heat conduction and tested on carbon-foam samples to obtain heat conductivity parameters for the CERN ALICE Collaboration's ITS3 R&D project.

New extended definition were provided for the Underlying Event (UE) in high-energy pp collisions with of 40% extra azimuthal range (Fig. 2). In collaboration with ICN UNAM they presented a study of the transverse momentum spectra and their evolution in function of the position of the azimuthal of the particles associated to the leading particle. Additionally, the behavior of the spherocity distribution in the same azimuthal bins is reported. The studies were made using proton-proton collisions at 13 TeV c.m. energy using PYTHIA8 Monte Carlo event generator. The Multiplicity and midrapidity transverse momentum spectra of charged hadrons have been analyzed in the non-extensive statistical framework. This work has been selected for the Editor's choice and cover page in Journal of Physics G [20].



Coordination of the Hungarian ALICE Group and participation in the Bergen pCT collaboration. — They coordinate the Hungarian contributions to CERN's largest heavy-ion experiment ALICE. This activity is many-folded: In addition to data analysis, our group has constructed and developed a new specialized Analysis Facility for the CERN ALICE Collaboration in the WSCLAB at the Wigner RCP. This HPC unit is dedicated for Big Data challenges as a joint activity with the Vesztergombi High-energy Physics Laboratory (VLAB), which awarded the TOP50 Hungarian research infrastructure title in 2021. In 2023, together with Raluca Cruceru they tested and used intensively with the new ALICE O^2 software framework hyperloop.

They were involved in the ITS3 and the FOCAL projects of the ALICE phase II upgrades. t A next generation heavy-ion experiment at the LHC is ALICE3, which was presented for the RRB in October 2023. They strongly engaged with this large-scale R&D project, and contributed to the beam measurements of the Muon ID (MID) detector and the DAQ development for the RICH detector subprojects as well.

They also contributed to the Bergen pCT collaboration, where the detector prototype of the tracking calorimeter has been built, and analysis tracking softwares were developed based on machine learning techniques [21-23]. They organized a one day Bergen pCT workshop. Manuscript on the development of the first application of Richardson–Lucy image reconstruction technique applied for proton-based imaging has been submitted. A TDK 2nd and an OTDK 1st price has been received on this topics by our MSc and PhD students.

Coordination of the Wigner Scientific Computational Laboratory (WSCLAB) — WSCLAB, as the TOP50 research infrastructure of the Hungarian national grant agency, NRDIO, were involed in several national and international projects. These are primary dedicated to massively parallel classical and quantum computing at various field of sciences. They have improved the CERN ALICE Analysis Facility, the CERN WLCG Grid T2 site of the CERN's ALICE and CMS collaborations, and the Wigner GPU Laboratory. The H2020 project were involved to the WSCLAB's projects during 2023, indeed the network bandwith capacity has been improved to 100GBps for the laboratory. The computing capacity was intensively used by several projects such as the Nanoplasmonic Laser Fusion National Laboratory, the Astronomy Department of the Eötvös University, the LIGO gravitational wave signal search, Heavy-ion Research Group of the Wigner RCP together with the University of Oxford, John Hopkins University (Baltimore). They supportoed several individual 'Lendület' projects. Academy-industry cooperation were establised with the Lombiq LTD, Ericsson Research, and SeismoCell. [6,21-23,25-41].

The WSCLAB has organized the "WSCLAB GPUDay 2023" conference and the "Lectures on Modern Scientific Programming 2023". They participated in the "CERN-Wigner Artificial Intelligence Academia-Industry Matching Event (AIME23)" and legally formed the Virtual Institute Association 'SciComp' to provide the platform to prolongate data science in Hungary. As a Hungarian representative of the CERN's Quantum Technology Initiative they closed the first phase (2020-2023) of the QTI project with Alberto di Meglio. They also prepared and submitted the proposal for the CERN Council on the QTI Phase II, in collaboration with the principal investigator Sofia Vallecorsa.

Education, PR and prizes. — Connected to the research group, they had 2 MSc students. Young colleagues participated in the young researcher's projects and 2 TDK theses were submitted for the competition, and one won a 3rd price (Zsófia Jólesz) at the ELTE Physics TDK and one received the 1st price (Ákos Sudár) at the OTDK conference.

They had 8 young PhD fellow associated with the research group. Senior colleagues are members of the ELTE, BME, PTE doctoral programmes. Győző Kovács and János Takátsy have submitted their PhD theses to the ELTE Physics Doctoral School, these works are being referred. Győző Kovács had also received the Györgyi Géza Price of the Wigner RCP. Balázs Szigeti and Balázs Pál has passed the mid-time complex exam at the Eötvös University Physics Doctoral School.

Group members played key role in the following workshop, conference and seminar organizations: "WSCLAB GPU Day 2023" at the at Wigner RCP; "Zimányi Winter School 2023," Budapest, Hungary, "PP2023, Margaret Island Symposium on Particles and Plasmas 2023", Lectures on Modern Scientific Programming 2023, Wigner 121 in Budapest and the "Bergen pCT Workshop" online. Group members participated in PR activities at their alma mater and high-school invitations, indeed the 'Researcher's Night' and the Garai Free University public outreach series. They were also active in outreach in media and radio broadcasts, and outreach publications [22,23].

References in referred journals (30)

1. Mallick, N. ; Prasad, S. ; Mishra, A.N. ; Sahoo, R. ; Barnaföldi, G.G. , A Deep Learning Based Estimator for Elliptic Flow in Heavy Ion Collisions, POS - PROCEEDINGS OF SCIENCE 422 Paper: 259 , 5 p. (2023) **IF= 0.0**
2. Mallick, N. ; Prasad, S. ; Mishra, A.N. ; Sahoo, R. ; Barnaföldi, G.G. Deep learning predicted elliptic flow of identified particles in heavy-ion collisions at the RHIC and LHC energies, PHYSICAL REVIEW D 107 : 9 Paper: 094001 , 11 p. (2023) **IF= 4.0**
3. Debadatta Behera, Neelkamal Mallick, Sushanta Tripathy, Suraj Prasad, Aditya Nath Mishra, and Raghunath Sahoo, Predictions on global properties in O+O collisions at the Large Hadron Collider using a multi-phase transport model, Eur. Phys. J. A 58, 175 (2022), **IF= 4.0**
4. Bíró, G. ; Pocsai, M. ; Barna, I.F. ; Barnaföldi, G.G. ; Moody, J.T. ; Demeter, G. Machine learning methods for schlieren imaging of a plasma channel in tenuous atomic vapor, OPTICS AND LASER TECHNOLOGY 159 Paper: 108948 , 10 p. (2023) IF= 4.0
5. Maydanyuk, S.P. ; Wolf, G. ; Shaulsky, K.A., Synthesis of Elements in Compact Stars in Pycnonuclear Reactions with Carbon Isotopes: Quasibound States vs. States of Zero-Points Vibrations, UNIVERSE 9 : 8 Paper: 354 , 16 p. (2023) **IF= 4.0**
6. Maydanyuk, S.P. Enhancement of incoherent bremsstrahlung in proton-nucleus scattering in the Δ -resonance energy region, PHYSICAL REVIEW C 107 : 2 Paper: 024618 , 16 p. (2023) **IF= 4.0**
7. Maydanyuk, SP ; Vasilevsky, VS, Systematic study of bremsstrahlung emission in reactions with light nuclei in cluster models, PHYSICAL REVIEW C 108 Paper: 064001 , 27 p. (2023) IF= 4.0
8. Takátsy, J. ; Kovács, P. ; Wolf, G. ; Schaffner-Bielich, J. What neutron stars tell about the hadron-quark phase transition: A Bayesian study, PHYSICAL REVIEW D 108 : 4 Paper: 043002 , 24 p. (2023) **IF= 4.0**

9. Takatsy, Janos ; Kovacs, Peter ; Wolf, Gyorgy; Schaffner-Bielich, Juergen, Neutron star properties in the (axial)vector meson extended linear sigma model, ASTRONOMISCHE NACHRICHTEN 344 : 6 Paper: e20230092 , 5 p. (2023) IF= 4.0
10. Balassa, G. ; Wolf, G. Low-energy charmonium, bottomonium and tetraquark production cross sections from a statistical model POS - PROCEEDINGS OF SCIENCE 419 Paper: 004 , 5 p. (2023) **IF= 4.0**
11. Balassa, G. ; Wolf, G. Hypernuclei production with a modified coalescence model in BUU transport calculations, EUROPEAN PHYSICAL JOURNAL A: HADRONS AND NUCLEI 59 : 4 Paper: 89 (2023) **IF= 4.0**
12. Balassa, Gabor, Fixed-energy inverse scattering with radial basis function neural networks and its application to neutron-α interactions, PROGRESS OF THEORETICAL AND EXPERIMENTAL PHYSICS 2023 : 11 Paper: 113A01 , 25 p. (2023) **IF= 4.0**
13. Homola, P. ; Kovács P., et al. Observation of large scale precursor correlations between cosmic rays and earthquakes with a periodicity similar to the solar cycle, JOURNAL OF ATMOSPHERIC AND SOLAR-TERRESTRIAL PHYSICS 247 Paper: 106068 , 11 p. (2023) **IF= 4.0**
14. Kovács, Gy. ; Kovács, P. ; Lo, P.M. ; Redlich, K. ; Wolf, G. Finite volume effects in the extended linear sigma model via low momentum cutoff POS - PROCEEDINGS OF SCIENCE 419 Paper: 029 , 4 p. (2023) **IF= 4.0**
15. Kovács, Gy.; Kovács, I; Lo, Pok Man ; Redlich, Krzysztof ; Wolf, György, Sensitivity of finite size effects to the boundary conditions and the vacuum term, PHYSICAL REVIEW D PARTICLES AND FIELDS 108 Paper: 076010 , 19 p. (2023) **IF= 4.0**
16. Horváth, A. ; Bamer, B. ; Barnafoldi, G.G. Numerical simulation of mirages above water bodies AMERICAN JOURNAL OF PHYSICS 91 : 12 pp. 999-1007. , 10 p. (2023) **IF= 4.0**
17. Szigeti, B.E.; Barna, I.F. ; Barnaföldi, G.G. , The Formulation of Scaling Expansion in an Euler-Poisson Dark-Fluid Model UNIVERSE 9 : 10 Paper: 431 , 17 p. (2023) **IF= 4.0**
18. Ván, P. , Toward a universal theory of stable evolution, PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A - MATHEMATICAL PHYSICAL & ENGINEERING SCIENCES 381 : 2252 Paper: 20220276 , 17 p. (2023) **IF= 4.0**
19. Ván, P., Holographic fluids: A thermodynamic road to quantum physics, PHYSICS OF FLUIDS 35 : 5 Paper: 057105 , 17 p. (2023) **IF= 4.0**
20. Mishra, A.N. ; Barnaföldi, G.G. ; Paić, G. Quantifying the underlying event: investigating angular dependence of multiplicity classes and transverse-momentum spectra in high-energy pp collisions at LHC energies, JOURNAL OF PHYSICS G-NUCLEAR AND PARTICLE PHYSICS 50 : 9 Paper: 095004 , 21 p. (2023) **IF= 4.0**
21. Aehle, Max ; Alme, Johan ; Barnaföldi, Gergely Gábor ; Blühdorn, Johannes ; Bodova, Tea ; Borshchov, Viatcheslav ; van den Brink, Anthony ; Eikeland, Viljar Nilsen ; Feofilov, Grigori ; Garth, Christoph et al. Exploration of differentiability in a proton computed tomography simulation framework, PHYSICS IN MEDICINE AND BIOLOGY 68 : 24 Paper: 244002 , 18 p. (2023) **IF= 4.0**
22. Aehle, M. ; Alme, J. ; Barnaföldi, G.G. ; Bodova, T. ; Borshchov, V. ; van den Brink, A. ; Chaar, M. ; Eikeland, V. ; Feofilov, G. ; Garth, C. et al. The Bergen proton CT system, JOURNAL O F INSTRUMENTATION 18 : 2 Paper: C02051 , 6 p. (2023) **IF= 4.0**
23. Schilling, Alexander; Aehle, Max ; Alme, Johan ; Barnaföldi, Gergely Gábor ; Bodova, Tea ; Borshchov, Viatcheslav ; van den Brink, Anthony ; Eikeland, Viljar Nilsen ; Feofilov, Grigori ; Garth, Christoph et al. Uncertainty-aware spot rejection rate as quality metric for proton therapy using a digital tracking calorimeter., PHYSICS IN MEDICINE AND BIOLOGY 68 : 19 Paper: 194001 , 17 p. (2023) **IF= 4.0**
24. Kilim, O. ; Mentes, A. ; Pál, B. ; Csabai, I. ; Gellért, Á. SARS-CoV-2 receptor-binding domain deep mutational AlphaFold2 structures, SCIENTIFIC DATA 10 : 1 Paper: 134 , 8 p. (2023) **IF= 4.0**

25. Pál, András ; Ohno, Masanori ; Mészáros, László ; Werner, Norbert ; Řípa, Jakub ; Csák, Balázs ; Dafčíková, Marianna ; Frajt, Marcel ; Fukazawa, Yasushi ; Hanák, Peter et al.
26. GRBAlpha: The smallest astrophysical space observatory, ASTRONOMY & ASTROPHYSICS 677 Paper: A40 , 9 p. (2023)
27. Qin, Yuhao ; Niu, Qinglin ; Guo, Dong ; Xiao, Sheng ; Tian, Baiting ; Wang, Yijie ; Qin, Zhi ; Diao, Xinyue ; Guan, Fenhai ; Si, Dawei** et al. Probing high-momentum component in nucleon momentum distribution by neutron-proton bremsstrahlung γ-rays in heavy ion reactions , 5 p. (2023)
28. Řípa, Jakub ; Takahashi, Hiromitsu ; Fukazawa, Yasushi ; Werner, Norbert ; Münz, Filip ; Pál, András ; Ohno, Masanori ; Dafčíková, Marianna ; Mészáros, László ; Csák, Balázs et al. The peak flux of GRB 221009A measured with GRBAlpha ASTRONOMY & ASTROPHYSICS 677 Paper: L2 , 7 p. (2023)
29. Schaul, L. ; Szücs, M. ,The effect of acoustic wave propagation on heat conduction near the critical point – a numerical study of piston effect, In: Székely, Edit (szerk.) 19th European Meeting on Supercritical Fluids : EMSF 2023 Budapest, Magyarország : Budapest University of Technology and Economics (2023) 177 p. pp. 81-81. , 1 p.
30. Szakáts, R. ; Kiss, Cs. ; Ortiz, J. L. ; Morales, N. ; Pál, A. ; Müller, T. G. ; Greiner, J. ; Santos-Sanz, P. ; Marton, G. ; Duffard, R. et al., Tidally locked rotation of the dwarf planet (136199) Eris discovered via long-term ground-based and space photometry, ASTRONOMY & ASTROPHYSICS 669 p. L3 , 13 p. (2023)

Further Highlighted publications (11)

31. Bíró, G ; Barnaföldi, GG, Machine Learning based KNO-scaling of charged hadron multiplicities with Hijing++ (2023)
32. Bíró, G ; Barnaföldi, GG ; Lévai, P, Dedicated Analysis Facility for HEP Experiments (2023)
33. Hirdi, Henriett Éva ; Barnaföldi, Gergely Gábor, A hadronterápia ápolási vonatkozásai, NŐVÉR 35 : 4 pp. 18-29. , 12 p. (2023)
34. Ván, PéterGradiens termomechanika és reológia [Gradient thermomechanics and rheology] Takács, Donát M.; Ván, Péter; Vásárhelyi, Balázs (szerk.) Kőzetmechanika és termodinamika [Rock mechanics and thermodynamics], Budapest, Magyarország : Egyesület a Tudomány és Technológia Egységéért (2023) 189 p. pp. 37-46. , 10 p.
35. Völgyesi, L. ; Tóth, Gy ; Égető, Cs ; Szondy, Gy ; Kiss, B. ; Barnaföldi, G.G. ; Fenyvesi, E. ; Lévai, P. ; Kovács, P. ; Imre, E. et al., A pre-earthquake signal detection by the Eötvös torsion balance In: Kaliakin, Victor N.; Sarsembayeva, Assel; Zhussupbekov, Askar Smart Geotechnics for Smart Societies : Proceedings of the 17th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering (17th ARC, Astana, Kazakhstan, 14-18 August, 2023), London, Egyesült Királyság / Anglia : CRC Press (2023) pp. 819-822. , 4 p.
36. Völgyesi, Lajos ; Szondy, György ; Tóth, Gyula ; Fenyvesi, Edit ; Kovács, Péter ; Kiss, Bálint ; Égető, Csaba ; Barnaföldi, Gergely Gábor ; Lévai, Péter ; Ván, Péter, Eötvös-ingák felújítása és továbbfejlesztése, jel-zaj viszonyaik elemzése, FIZIKAI SZEMLE 73 : 12 pp. 416-422. , 7 p. (2023)
37. Fülöp, Tamás ; Szücs, Mátyás Az alakváltozási tenzor előállítása felületen mért elmozdulásjelből [Strain recovery from measured surface displacement] In: Takács, Donát M.; Ván, Péter; Vásárhelyi, Balázs (szerk.) Kőzetmechanika és termodinamika [Rock mechanics and thermodynamics] Budapest, Magyarország : Egyesület a Tudomány és Technológia Egységéért (2023) 189 p. pp. 17-35. Paper: 2. fejezet , 19 p.

38. Takács, Donát M.; Fülöp, Tamás ; Pozsár, Áron ; Kovács, Róbert ; Szücs, Mátyás ; Ván, Peter, Modelling time-dependent processes resulting from thermo-viscoelastic behaviour of rocks In: Schubert, Wulf; Kluckner, Alexander (szerk.) Proceedings of the ISRM 15th International Congress on Rock Mechanics and Rock Engineering & 72nd Geomechanics Colloquium : Challenges in Rock Mechanics and Rock Engineering , Salzburg, Ausztria : Austrian Society for Geomechanics (2023) 3,018 p. pp. 2091-2096.
39. Takács, Donát; Kovács, Róbert ; Szücs, Mátyás ; Pozsár, Áron ; Fülöp, Tamás, Thermodynamically extended symplectic numerical simulation of viscoelastic, thermal expansion and heat conduction phenomena in solids, In: Joint European Thermodynamics Conference 2023 : June 12–17, 2023 – Salerno, Italy (2023) 108 p. pp. 68-68. , 1 p.
40. Takács, Donát M. (szerk.) ; Ván, Péter (szerk.) ; Vásárhelyi, Balázs (szerk.) Kőzetmechanika és termodinamika [Rock mechanics and thermodynamics] Budapest, Magyarország : Egyesület a Tudomány és Technológia Egységéért (2023) , 189 p.
41. Szigeti, Balázs Endre ; Rábóczki, Bence ; Dobos, Csenge , Mafihe, avagy 35 éve a fizikushallgatók szolgálatában, FIZIKAI SZEMLE 73 : 2 pp. 70-72. , 3 p. (2023)

LIGO/VIRGO Publications (8)

1. Abbott, R. ; Abbott, T.D. ; Acernese, F. ; Ackley, K. ; Adams, C. ; Adhikari, N. ; Adhikari, R.X. ; Adya, V.B. ; Affeldt, C. ; Agarwal, D. et al.
2. Search for Gravitational Waves Associated with Fast Radio Bursts Detected by CHIME/FRB during the LIGO-Virgo Observing Run O3a, ASTROPHYSICAL JOURNAL 955 : 2 Paper: 155 , 23 p. (2023)
3. Abbott, R. ; Abe, H. ; Acernese, F. ; Ackley, K. ; Adhicary, S. ; Adhikari, N. ; Adhikari, R.X. ; Adkins, V.K. ; Adya, V.B. ; Affeldt, C. et al., Open Data from the Third Observing Run of LIGO, Virgo, KAGRA, and GEO, ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES 267 : 2 Paper: 29 , 27 p. (2023)
4. Abbott, R. ; Abbott, T.D. ; Acernese, F. ; Ackley, K. ; Adams, C. ; Adhikari, N. ; Adhikari, R.X. ; Adya, V.B. ; Affeldt, C. ; Agarwal, D. et al. Population of Merging Compact Binaries Inferred Using Gravitational Waves through GWTC-3, PHYSICAL REVIEW X 13 : 1 Paper: 011048 , 75 p. (2023)
5. Acernese, F. ; Agathos, M. ; Ain, A. ; Albanesi, S. ; Allocca, A. ; Amato, A. ; Andrade, T. ; Andres, N. ; Andrés-Carcasona, M. ; Andrić, T. et al., Virgo detector characterization and data quality: Results from the O3 run, CLASSICAL AND QUANTUM GRAVITY 40 : 18 Paper: 185006 , 57 p. (2023)
6. Acernese, F. ; Agathos, M. ; Ain, A. ; Albanesi, S. ; Allocca, A. ; Amato, A. ; Andrade, T. ; Andres, N. ; Andrés-Carcasona, M. ; Andrić, T. et al. , Virgo detector characterization and data quality: Tools, CLASSICAL AND QUANTUM GRAVITY 40 : 18 Paper: 185005 , 44 p. (2023)
7. Acernese, F. ; Agathos, M. ; Ain, A. ; Albanesi, S. ; Alléné, C. ; Allocca, A. ; Amato, A. ; Andia, M. ; Andrade, T. ; Andres, N. et al. , Advanced Virgo Plus: Future Perspectives JOURNAL OF PHYSICS-CONFERENCE SERIES 2429 : 1 Paper: 012040 , 11 p. (2023)
8. Acernese, F. ; Agathos, M. ; Ain, A. ; Albanesi, S. ; Alléné, C. ; Allocca, A. ; Amato, A. ; Andia, M. ; Andrade, T. ; Andres, N. et al. The Advanced Virgo+ status, JOURNAL OF PHYSICS-CONFERENCE SERIES 2429 : 1 Paper: 012039 , 12 p. (2023)

ALICE Publications (62)

1. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Study of the p–p–K + and p–p–K - dynamics

using the femtoscopy technique EUROPEAN PHYSICAL JOURNAL A: HADRONS AND NUCLEI 59 : 12 Paper: 298 , 14 p. (2023)

2. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al., Measurement of non-prompt D -meson elliptic flow in Pb–Pb collisions at √sNN=5.02 TeV, EUROPEAN PHYSICAL JOURNAL C 83 : 12 Paper: 1123 , 17 p. (2023)
3. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurements of Groomed-Jet Substructure of Charm Jets Tagged by D^{0} Mesons in Proton-Proton Collisions at sqrt[s]=13 TeV, PHYSICAL REVIEW LETTERS 131 : 19 Paper: 192301 , 13 p. (2023)
4. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Energy dependence of coherent photonuclear production of J/ψ mesons in ultra-peripheral Pb-Pb collisions at √sNN = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 10 Paper: 119 , 41 p. (2023)
5. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the non-prompt D-meson fraction as a function of multiplicity in proton-proton collisions at √s = 13 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 10 Paper: 92 , 33 p. (2023)
6. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of inclusive J/ψ pair production cross section in pp collisions at s =13 TeV PHYSICAL REVIEW C 108 : 4 Paper: 045203 , 13 p. (2023)
7. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Enhanced Deuteron Coalescence Probability in Jets, PHYSICAL REVIEW LETTERS 131 : 4 Paper: 042301 , 15 p. (2023)
8. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. First measurement of the Λ-Ξ interaction in proton-proton collisions at the LHC PHYSICS LETTERS B 844 Paper: 137223 , 13 p. (2023)
9. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of beauty-strange meson production in Pb–Pb collisions at sNN=5.02TeV via non-prompt Ds+ mesons PHYSICS LETTERS B 846 Paper: 137561 , 16 p. (2023)
10. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. First Measurement of Antideuteron Number Fluctuations at Energies Available at the Large Hadron Collider PHYSICAL REVIEW LETTERS 131 : 4 Paper: 041901 , 12 p. (2023)
11. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Inclusive and multiplicity dependent production of electrons from heavy-flavour hadron decays in pp and p-Pb collisions, JOURNAL OF HIGH ENERGY PHYSICS 2023 : 8 Paper: 006 , 53 p. (2023)
12. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. First measurement of prompt and non-prompt D∗+ vector meson spin alignment in pp collisions at s=13 TeV PHYSICS LETTERS B 846 Paper: 137920 , 15 p. (2023)
13. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Photoproduction of low-pT J/ψ from peripheral to central Pb–Pb collisions at 5.02 TeV PHYSICS LETTERS B 846 Paper: 137467 , 14 p. (2023)

14. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of electrons from beauty-hadron decays in pp and Pb-Pb collisions at sNN =5.02 TeV PHYSICAL REVIEW C 108 : 3 Paper: 034906 , 24 p. (2023)
15. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. System-size dependence of the charged-particle pseudorapidity density at sNN=5.02TeV for pp, p–Pb, and Pb–Pb collisions PHYSICS LETTERS B 845 Paper: 137730 , 13 p. (2023)
16. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Accessing the strong interaction between Λ baryons and charged kaons with the femtoscopy technique at the LHC PHYSICS LETTERS B 845 Paper: 138145 , 15 p. (2023)
17. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the production of (anti)nuclei in p–Pb collisions at sNN=8.16TeV PHYSICS LETTERS B 846 Paper: 137795 , 17 p. (2023)
18. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. First measurement of Ωc0 production in pp collisions at s=13 TeV PHYSICS LETTERS B 846 Paper: 137625 , 13 p. (2023)
19. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurements of azimuthal anisotropies at forward and backward rapidity with muons in high-multiplicity p–Pb collisions at sNN=8.16 TeV, PHYSICS LETTERS B 846 Paper: 137782 , 20 p. (2023)
20. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Elliptic flow of charged particles at midrapidity relative to the spectator plane in Pb–Pb and Xe–Xe collisions PHYSICS LETTERS B 846 Paper: 137453 , 15 p. (2023)
21. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the Lifetime and Λ Separation Energy of _{Λ}^{3}H PHYSICAL REVIEW LETTERS 131 : 10 Paper: 102302 , 13 p. (2023)
22. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. . Performance of the ALICE Electromagnetic Calorimeter JOURNAL OF INSTRUMENTATION 18 : 8 Paper: P08007 , 137 p. (2023)
23. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the J/ψ Polarization with Respect to the Event Plane in Pb-Pb Collisions at the LHC PHYSICAL REVIEW LETTERS 131 : 4 Paper: 042303 , 13 p. (2023)
24. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Neutron emission in ultraperipheral Pb-Pb collisions at & RADIC;sNN=5.02 TeV PHYSICAL REVIEW C 107 : 6 Paper: 064902 , 18 p. (2023)
25. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Towards the understanding of the genuine three-body interaction for p-p-p and p-p-Lambda EUROPEAN PHYSICAL JOURNAL A: HADRONS AND NUCLEI 59 : 7 Paper: 145 , 22 p. (2023)
26. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Multiplicity dependence of charged-particle production in pp, p–Pb, Xe–Xe and Pb–Pb collisions at the LHC PHYSICS LETTERS B 845 Paper: 138110 , 21 p. (2023)

27. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Azimuthal correlations of heavy-flavor hadron decay electrons with charged particles in pp and p–Pb collisions at √sNN = 5.02 TeV EUROPEAN PHYSICAL JOURNAL C 83 : 8 Paper: 741 , 30 p. (2023)
28. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the Λ hyperon lifetime, PHYSICAL REVIEW D 108 : 3 Paper: 032009 , 15 p. (2023)
29. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Multiplicity and rapidity dependence of K ∗(892) and ϕ(1020) production in p–Pb collisions at √sNN= 5.02 TeV, EUROPEAN PHYSICAL JOURNAL C 83 : 6 Paper: 540 , 21 p. (2023)
30. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al.
31. Closing in on critical net-baryon fluctuations at LHC energies: Cumulants up to third order in Pb–Pb collisions, PHYSICS LETTERS B 844 Paper: 137545 , 15 p. (2023)
32. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the angle between jet axes in pp collisions at √s = 5.02 TeV, JOURNAL OF HIGH ENERGY PHYSICS 2023 : 7 Paper: 201 , 48 p. (2023)
33. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Inclusive photon production at forward rapidities in pp and p–Pb collisions at √sNN=5.02 TeV, EUROPEAN PHYSICAL JOURNAL C 83 : 7 Paper: 661 , 26 p. (2023)
34. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurements of the groomed jet radius and momentum splitting fraction with the soft drop and dynamical grooming algorithms in pp collisions at √s = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 5 Paper: 244 , 27 p. (2023)
35. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Light (anti)nuclei production in Pb-Pb collisions at sNN =5.02 TeV PHYSICAL REVIEW C 107 : 6 Paper: 064904 , 16 p. (2023)
36. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. First measurement of Λc+ production down to pT=0 in pp and p -Pb collisions at sNN =5.02 TeV PHYSICAL REVIEW C 107 : 6 Paper: 064901 , 19 p. (2023)
37. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Production of KS0 , Λ (Λ ¯), Ξ±, and Ω± in jets and in the underlying event in pp and p–Pb collisions, JOURNAL OF HIGH ENERGY PHYSICS 2023 : 7 Paper: 136 , 40 p. (2023)
38. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. J/ψ production at midrapidity in p-Pb collisions at √sNN = 8.16 TeV, JOURNAL OF HIGH ENERGY PHYSICS 2023 : 7 Paper: 137 , 37 p. (2023)
39. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Symmetry plane correlations in Pb–Pb collisions at √sNN=2.76 TeV EUROPEAN PHYSICAL JOURNAL C 83 : 7 Paper: 576 , 21 p. (2023)
40. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Dielectron production at midrapidity at low

transverse momentum in peripheral and semi-peripheral Pb–Pb collisions at √sNN = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 6 Paper: 24 , 32 p. (2023)

41. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of ψ (2S) production as a function of charged-particle pseudorapidity density in pp collisions at √s = 13 TeV and p–Pb collisions at √sNN = 8.16 TeV with ALICE at the LHC JOURNAL OF HIGH ENERGY PHYSICS 2023 : 6 Paper: 147 , 29 p. (2023)
42. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of the production of charm jets tagged with D0 mesons in pp collisions at √s = 5.02 and 13 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 6 Paper: 133 , 40 p. (2023)
43. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Study of charged particle production at high pT using event topology in pp, p–Pb and Pb–Pb collisions at sNN=5.02 TeV PHYSICS LETTERS B 843 Paper: 137649 , 14 p. (2023)
44. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. K∗(892)0 and ϕ(1020) production in p-Pb collisions at sNN =8.16 TeV PHYSICAL REVIEW C 107 : 5 Paper: 055201 , 21 p. (2023)
45. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Investigation of K+K- interactions via femtoscopy in Pb-Pb collisions at sNN =2.76 TeV at the CERN Large Hadron Collider, PHYSICAL REVIEW C 107 : 5 Paper: 054904 , 16 p. (2023)
46. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Two-particle transverse momentum correlations in pp and p -Pb collisions at energies available at the CERN Large Hadron Collider PHYSICAL REVIEW C 107 : 5 Paper: 054617 , 20 p. (2023)
47. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Observation of flow angle and flow magnitude fluctuations in Pb-Pb collisions at sNN =5.02 TeV at the CERN Large Hadron Collider PHYSICAL REVIEW C 107 : 5 Paper: L051901 , 13 p. (2023)
48. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Production of pions, kaons, and protons as a function of the relative transverse activity classifier in pp collisions at √s = 13 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 6 Paper: 27 , 36 p. (2023)
49. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Jet-like correlations with respect to KS0 and Λ (Λ ¯) in pp and central Pb–Pb collisions at √sNN=5.02 TeV EUROPEAN PHYSICAL JOURNAL C 83 : 6 Paper: 497 , 20 p. (2023)
50. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Underlying-event properties in pp and p–Pb collisions at √sNN = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 6 Paper: 23 , 38 p. (2023)
51. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of inclusive and leading subjet fragmentation in pp and Pb–Pb collisions at √sNN = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 5 Paper: 245 , 34 p. (2023)
52. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Anisotropic flow and flow fluctuations of

identified hadrons in Pb–Pb collisions at √sNN = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 5 Paper: 243 , 34 p. (2023)

53. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Σ (1385) ± resonance production in Pb–Pb collisions at √sNN=5.02 TeV EUROPEAN PHYSICAL JOURNAL C 83 : 5 Paper: 351 , 16 p. (2023)
54. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. W±-boson production in p–Pb collisions at √sNN = 8.16 TeV and Pb–Pb collisions at √sNN = 5.02 TeV JOURNAL OF HIGH ENERGY PHYSICS 2023 : 5 Paper: 36 , 44 p. (2023)
55. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Constraining the K ¯ N coupled channel dynamics using femtoscopic correlations at the LHC EUROPEAN PHYSICAL JOURNAL C 83 : 4 Paper: 340 , 21 p. (2023)
56. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al.
57. Constraining hadronization mechanisms with Λc+/D0 production ratios in Pb–Pb collisions at sNN=5.02 TeV PHYSICS LETTERS B 839 Paper: 137796 , 14 p. (2023)
58. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Inclusive quarkonium production in pp collisions at √s = 5.02 TeV EUROPEAN PHYSICAL JOURNAL C 83 : 1 Paper: 61 , 27 p. (2023)
59. Acharya S, …. Barnaföldi GG, Bencédi Gy, Bíró G, Cruceru R, Frajna E, Gyulai L, Lévai P, Mazzilli M, Varga D, Varga Z, Varga-Kőfaragó M, Vértesi R et al. Measurement of anti-3He nuclei absorption in matter and impact on their propagation in the Galaxy NATURE PHYSICS 19 : 1 pp. 61-71. , 11 p. (2023)
60. Vértesi, R. Jet Substructure Measurements with ALICE, PHYSICS OF PARTICLES AND NUCLEI 54 : 4 pp. 670-676. , 7 p. (2023)
61. Vértesi, R. ; ALICE Collaboration (Kollaborációs szervezet) CHARM AND BEAUTY PRODUCTION AND HADRONIZATION WITH THE ALICE EXPERIMENT ACTA PHYSICA POLONICA B PROCEEDINGS SUPPLEMENT 16 : 3 Paper: 3-A20 , 6 p. (2023)

62. Marianna Mazzili ALICE Collaboration

WSCLAB-related publications

42. Rakyta P, Morse G, Nádori J, Majnay-Takács Z, Mencer O, Zimborás Z, Highly optimized quantum circuits synthesized via data-flow engines (arXiv: 2211.07685)

43. Zsurka E, Plaszkó N, Rakyta P, Kormányos A, Non-local Andreev reflection through Andreev molecular states in graphene Josephson junctions (arXiv: 2208.11536)

44. Rakyta P and Zimborás Z, Efficient quantum gate decomposition via adaptive circuit compression (arXiv: 2203.04426)

45. Barnaföldi GG. et al. Numerical simulation of mirages above water bodies (Submitted to AJP)

46. Gábor Bíró, Mihály Pocsai, Imre Ferenc Barna, Joshua T. Moody, Gábor Demeter, Machine learning methods for Schlieren imaging of a plasma channel in tenuous atomic vapor, Optics & Laser Technology Volume 159, April 2023, 108948, (2205.12731)

47. Lin, Zeming, et al. "Language models of protein sequences at the scale of evolution enable accurate structure prediction." bioRxiv (2022).

48. Kilim, Oz et al. "SARS-CoV-2 RBD deep mutational AlphaFold2 structures carry phenotypic information", submitted to Scientific Data (2022);

49. Sudár Á and Barnaföldi GG, Proton Computed Tomography Based on Richardson-Lucy Algorithm arXiv:2212.00126 (Submitted to Physics in Medicine & Biology)

50. Gergácz M. and Keresztúri Á.: Melting possibility of remnant seasonal water ice patches on Mars, arXiv:2212.02166 (Submitted to Earth and Planetary Science Letters)